4 Operations Plan

This Operations Plan for the Downtown Circulator presents the proposed design of the Circulator service, including routes, stops, and running way elements, as well as travel times and service levels. It also presents the estimated resources required and the estimated ridership and impacts of the service. Finally, plans for the phasing in of the service and evaluation of the effectiveness of the service are presented.

4.1 Service Design

This section presents the proposed circulator routes and services.

4.1.1 Routes and Physical Elements

This Implementation Plan covers four routes proposed for implementation. This section presents the proposed routes, including the locations of all Circulator bus stops, followed by a discussion of routing options that were considered and rejected as part of the service design process. Finally, other physical elements, such as shelters, and possible running way improvements are discussed.

The market analysis determined that a very large market exists for visitor travel. The market for travel by downtown workers and shoppers is significant, but smaller than the visitor market. This directed the initial implementation recommendations toward routes that would serve visitors and routes that would serve a mixture of visitors and downtown workers. The need for short, direct routes emphasized by other circulator operators, along with cost concerns, kept the proposed route design simple and led to the rejection of several routing changes that were considered.

Routes and Stops

The four routes proposed for implementation are shown in Figure 4-1 and Figure 4-2. The four routes, and the areas they serve, are:

- **White House-Capitol Route** – serves the White House, Foggy Bottom, the State Department area, Federal Triangle, the National Mall, the Capitol, Union Station, and downtown
- **Monuments Route** – serves the Washington, Jefferson, Roosevelt, Korean War, Lincoln, Vietnam Veterans, and World War II Memorials and connects them to Metrorail and the White-House Capitol Route.
- **North-South Route** – serves the new convention center, the downtown area, the National Mall, the L'Enfant Plaza area, and the Southwest Waterfront.
- **K Street Route** – serves Union Station, the new convention center, K Street, and Georgetown.

The exact alignment followed by each route is outlined below and shown in Figures 4-3 through 1-10.

The White House-Capitol Loop will run both clockwise and counter-clockwise. There are two alternatives being considered. Between 15th Street and 23rd Street, Alternative A would use Pennsylvania Avenue, whereas Alternative B would use E Street. Starting at Jefferson Drive and 12th Street in a counter-clockwise direction, Alternative A would run:

- east on Jefferson Drive SW;
- right onto 7th Street SW (southbound);
- left onto Independence Avenue SW (eastbound);
- left onto 1st Street (northbound) SE;
- right onto Massachusetts NE (eastbound);
- into Union Station drop-off area;
- right onto Massachusetts NE (westbound);
- left onto E Street NE (westbound);
- right onto 3rd Street NW (northbound)
- left onto F Street NW (westbound); [24]
- right onto 15th Street NW (northbound);
- left onto Pennsylvania Avenue NW (westbound);
- left onto 21st Street NW (southbound);
- right onto Eye Street NW (westbound);
- left onto 23rd Street NW (southbound);
- left onto Constitution NW (eastbound);
- right onto 14th Street NW (southbound);
- left onto Jefferson Drive SW (eastbound).

Alternative B would be identical to Alternative A until F Street. With the segment that differs from Alternative A shown in italics, Alternative B would run:

- east on Jefferson Drive SW;
- right onto 7th Street SW (southbound);
- left onto Independence Avenue SW (eastbound);
- left onto 1st Street (northbound) SE;
- right onto Massachusetts NE (eastbound);
- into Union Station drop-off area;
- right onto Massachusetts NE (westbound);
- left onto E Street NE (westbound);
- right onto 3rd Street NW (northbound)
- left onto F Street NW (westbound); [25]
- *left onto 13th Street NW(southbound);*
- *right onto Pennsylvania Avenue South NW (westbound);*
- *straight onto E Street NW (westbound);*

[24] An option is also being considered that would turn left from F Street (westbound) onto 13th Street (southbound), right on Pennsylvania Avenue South (westbound), right onto 15th Street (northbound), and continue as above.

[25] An option is also being considered that would continue on F Street (westbound), turn left onto 15th Street (southbound), right on E Street (westbound), and continue as above.

- left onto 23rd Street NW (southbound);
- left onto Constitution NW (eastbound);
- right onto 14th Street NW (southbound);
- left onto Jefferson Drive SW (eastbound).

The clockwise route for both alternatives will run on the same streets as the counter-clockwise direction, except along the Mall where they will utilize 3rd Street and Madison Drive between 3rd and 14th Streets rather than Jefferson Drive, 7th Street, and Independence.

The Monuments Loop would operate as a one-way loop along the southern portion of the project area, circling the western portion of the National Mall. Starting at Jefferson Drive and 12th (Smithsonian Metrorail), the Circulator routing would be:

- right onto 12th Street SW (southbound);
- right onto Independence Avenue SW (westbound);
- left onto Raoull Wallenberg Place SW (southbound);
- left onto Maine Avenue SW (eastbound);
- right onto East Basin Drive SW (southbound);
- merge onto Ohio Drive SW (northbound);
- merge onto 23rd Street SW (northbound);
- merge onto Henry Bacon Drive NW (northbound);
- east in private right-of-way parallel to Constitution;
- merge onto Constitution NW;
- right onto 17th Street NW (southbound);
- merge onto Independence Avenue SW (westbound);
- left onto U–turn to Independence Avenue SW (eastbound);
- left onto 15th Street SW (northbound);
- right onto Jefferson Drive SW (eastbound).

If Alternative B is selected for the White House-Capitol Route, a limited number of trips on the Monuments Route will use the "Presidential Routing". The Presidential Routing would be:

- right onto 12th Street SW (southbound);
- right onto Independence Avenue SW (westbound);
- left onto Raoull Wallenberg Place SW (southbound);
- left onto Maine Avenue SW (eastbound);
- right onto East Basin Drive SW (southbound);
- merge onto Ohio Drive SW (northbound);
- merge onto 23rd Street SW (northbound);
- merge onto Henry Bacon Drive NW (northbound);
- *right onto Constitution NW - main roadway (eastbound);*
- *left onto 17th Street NW (northbound);*
- *right onto Pennsylvania Avenue NW (eastbound);*
- *right onto 15th Street NW (southbound);*
- *left onto Jefferson Drive NW (eastbound).*

The North-South Route will cross the Mall on 7th Street. South of the Mall it will follow a clockwise loop on 7th Street and L'Enfant Promenade. North of Pennsylvania Avenue it will follow a counter-clockwise loop on 7th Street and 9th Street. Starting at 9th Street and L Street NW, the Circulator would run:

- south on 9th Street NW
- left onto Pennsylvania Avenue NW (eastbound);
- right onto 7th Street NW (southbound);
- right onto Maine Avenue SW (westbound);
- right onto 9th Street SW (northbound);
- left onto L'Enfant Promenade SW (northbound);
- right onto Independence Avenue SW (eastbound);
- left onto 7th Street SW (northbound);
- left on L Street NW (westbound).

The K Street Route will run along on Massachusetts Avenue, K Street, and M Street between Union Station and Georgetown. Starting at Union Station, the Circulator would run:

- right onto Massachusetts Avenue NE (westbound);
- right onto 7th Street NW (northbound);
- left onto L Street NW (westbound);
- left onto 9th Street NW (southbound);
- right onto K Street NW (westbound);
- around Washington Circle NW (surface level)
- continue on K Street NW (westbound);
- right onto Wisconsin NW (northbound);
- left onto M Street NW (westbound);
- end at Canal Road entrance to Georgetown University.

From Georgetown to Union Station, the Circulator would return along the same route except that it would use the south side of Mt. Vernon Square, instead of L Street, between 9th and 7th.

Based on the above descriptions, the round trip length of each route would be as follows:

White House-Capitol Route (clockwise)	6.9 miles (Alt. A) / 6.5 miles (Alt. B)
White House-Capitol Route (counter-clockwise)	6.9 miles (Alt. A) / 6.5 miles (Alt. B)
Monuments Route	4.2 miles / 4.8 miles (Presidential)
North-South Route	4.2 miles
K Street Route	9.2 miles

Circulator stop locations have been identified for each stop on all four routes. The circulator routes will make use of existing Metrobus stops when operating on streets with Metrobus

service, although not all Metrobus stops on those streets will be used.[26] On the Mall, the circulator will make use of many of the existing Tourmobile stops. Several circulator stops, however, will need to be instituted in places where there is no existing Metrobus or Tourmobile stop. Figures 4-3 through 4-10 show the locations of all proposed stops, and indicate whether stops are existing or need to be created. A complete listing of all proposed stops by route is contained in Appendix C. Under Alternative A, 52 new bus stops would be added and 69 existing Metrobus and Tourmobile stops would be used by the Circulator. Under Alternative B, 55 new bus stops would be added and 64 existing stops would be used.

Route Options Rejected

Several route alignment options were considered for each proposed route. On the White House-Capitol Route, several alternatives were considered for the part of the route west of 14th Street. An early option using 17th Street between Pennsylvania and Independence was replaced by the preferred alternatives A and B in order to serve more federal and non-federal workers west of the White House and in the Federal Triangle. Options that provided closer service to the World War II Memorial and the Washington Monument stop at 15th and Jefferson were rejected in order to provide closer service to Federal Triangle buildings near Constitution and 14th Street. A diversion of the clockwise loop along Jefferson, 12th, and Independence, directly serving the Smithsonian Metrorail Mall entrance, was considered desirable but was rejected due to the impacts of the additional travel time on through riders, the indirectness of the route, and increased operating costs.

An extension of the Monuments Route further east along the Mall was considered. The extension along Jefferson Drive to 3rd Street, returning along Madison Drive and 15th, would eliminate a transfer for visitors traveling between the monuments and the museums at the eastern end of the Mall. This extension was rejected when it was determined that the expansion of this route to overlap with the White House-Capitol Route would not translate into any cost savings on the White House-Capitol Route, while the cost of a two mile (round trip) extension of the Monuments Route would be significant. Also, the extension of the White House-Capitol Loop to 23rd Street would provide direct service between the Lincoln, Vietnam Veterans, and Korea Memorials to the eastern part of the Mall.

Numerous alternatives were examined for the North-South Route. Alternatives that would serve visitors better by connecting the route more directly with more Mall destinations, including a direct tie-in to the proposed hub location at the Smithsonian Metrorail Mall entrance, were rejected in order to provide a connection between the downtown area and the employment centers south of the mall to serve trips by downtown workers. Alternatives were also considered that included service on a single street instead of the loops, service using dedicated bus lanes. The chosen option was selected in order to provide direct access to more businesses and offices despite the possibly longer travel times for riders resulting from the loops.

Several options were considered in the Pennsylvania Avenue and K Street corridors before Pennsylvania Avenue, west of the White House, was added to the White House-Capitol Route. East-west routes that extended to the Capitol or to the mall were rejected because of the overlap with the White House-Capitol and North-South Routes. Options were also considered that did

[26] On several Streets, such as F Street and 7th Street, many Metrobus routes turn onto and off of the street so there are more bus stops than would be necessary with a single straight route.

not extend as far west as Georgetown. Service to the Kennedy Center was deferred until such time as adequate infrastructure is in place to serve the center from 23rd Street.

Running Way Improvements and Restrictions
It is generally feasible for the proposed circulator routes to operate on existing rights-of-way, but there are several locations were improvements are needed or restrictions need to be modified. These include:

- **Pennsylvania Avenue between 15th and 17th Streets NW** – Pennsylvania Avenue between 15th and 17th Street has been restricted from full traffic since 1995 for security reasons and is expected to remain so. The National Capital Planning Commission, as part of its new security plan[27], has developed a concept design for this section of Pennsylvania Avenue that includes a right-of-way for the circulator. The proposed White House-Capitol circulator route is consistent with the NCPC design concept. This street would be used by the White House-Capitol Route Alternative A. If Alternative B is chosen, this street would be used by the Presidential Routing of the Monuments Route.
- **E Street between 15th and 17th Streets NW** – E Street between 15th and 17th Street is also restricted from full traffic for security reasons. This street would be used by the White House-Capitol Route Alternative B. Access for circulator buses would be needed.
- **E Street eastbound between 23rd Street and Virginia Avenue NW** – E Street between 23rd Street and Virginia Avenue is restricted from full traffic for security reasons due to its proximity to the State Department. This street would be used by the White House-Capitol Route Alternative B. Access for circulator buses would be needed.
- **Jefferson Drive and 12th Street SW** – The Monuments Route requires a right turn from Jefferson Drive onto 12th Street. The turning radius for that turning movement is currently restricted by the presence of a temporary structure on Jefferson Drive bridging the 12th Street underpass. For a circulator vehicle to make that turn , either that temporary structure must be removed or the corner must be cut back to increase the turning radius.
- **14th Street and Constitution NW** – The clockwise direction of the White House-Capitol Route includes a left turn from 14th Street to Constitution Avenue. This turn is prohibited by current traffic regulations. This restriction will need to be removed for circulator buses.
- **Independence and 1st Street SE** – The counter-clockwise direction of the White House-Capitol Route includes a left turn from Independence Avenue to 1st Street. This turn is prohibited by current traffic regulations from 4:00 to 6:30 p.m. This restriction will need to be removed for circulator buses.
- **K Street NW** – The District of Columbia Department of Transportation is currently developing a plan for a major reconfiguration of K Street between Mt. Vernon Square and Washington Circle. This implementation plan assumes that this project has been completed.

[27] National Capitol Planning Commission, *The National Capitol Urban Design and Security Plan*, July 2002

There are also locations where the Monuments circulator route would travel that are currently restricted to National Park Service Tourmobile vehicles. These are a short section of the Circle behind the Lincoln Memorial and the dedicated right-of-way just inside the Mall parallel to Constitution Avenue between Henry Bacon Drive and just before 17th Street. Both the Monuments and White House-Capitol Routes would make use of existing Tourmobile turn-outs on the Mall.

Future Bus Lanes

In the future, it would be advantageous to consider improving travel times on the White House-Capitol Route by implementing exclusive bus lanes and intersection improvements at key places on the alignment. Preliminary analyses examined the possibility of converting existing traffic or parking lanes to exclusive bus lanes and examined the possible travel time and cost benefits of such actions.

Each street traversed by the circulator was first analyzed to understand whether existing travel lanes could be converted to Circulator-only use. Due to the heavy peak hour traffic in Washington DC, no possible cases were found. The next step was an examination of streets to be used by the circulator in the downtown (not including the Mall) that would have relatively slow bus travel times, but also either have on-street parking, or have had on-street parking removed for security reasons. These would be possible initial candidates for conversion of the curb lane to an exclusive Circulator lane. Those identified include:

- **1st Street Southbound between Union Station and Independence** – The clockwise direction of the White House-Capitol Route passes along the east side of the Capitol where parking has been removed and there are few conflicting turning movements. It appears feasible that an exclusive Circulator lane could be instituted in the curb lane beginning either at Massachusetts Avenue (eliminating some parking) or at D Street and ending with the right turn onto Independence Avenue. The proposed lane would provide little benefit to Metrobus with only one all-day Metrobus line and some peak-only routes able to use a part of the lane.
- **F Street (both directions) between 15th and 7th Streets** – F Street in the downtown area would be served by the White House-Capitol Route. Between 15th and 7th Street there is parking on both sides although there are several existing Metrobus stops. It appears feasible that an exclusive Circulator lane could be instituted in the curb lane on both sides in this area. Circulator buses would have to share this lane with right-turning traffic at most of the eight intersections. Metrobus Routes 42 and 54 could make effective use of the lanes for short segments.

In addition, there are several intersections where improvements should be investigated in order to speed the operation of the circulator. These include:

- 1st Street southbound right turn onto Independence Avenue
- 3rd Street northbound left turn lane onto Madison Drive
- Madison Drive at 7th Street allow through buses to use right turn lane

Others locations should also be investigated for future bus priority and traffic improvements.

Stops and Shelters
The circulator will make use of approximately 70 existing Metrobus and Tourmobile stops. At these stops, circulator signage will be added but no other improvements are anticipated. At the approximately 50 circulator stops that will be new stops, standard shelters will be added under the District's existing bus shelter contract. Shelters without advertising will be installed where advertising is prohibited, such as on the National Mall.

4.1.2 Service Elements

Service Span
Service span is the term used to describe the time of day at which service begins and ends. The service span needs to be long enough to cover the hours during which most potential users are traveling. As indicated in the market analysis, potential users for the circulator include visitors accessing the attractions that are furthest from Metrorail stations, visitors traveling among the various attractions, and downtown workers and shoppers making trips within the core area. The circulator will need to operate during the hours that visitors are traveling and during the hours that downtown workers and shoppers are traveling within the core. The circulator is not expected to carry a significant number of commuters to downtown, since the Metrorail and Metrobus systems generally provide good access to most of downtown, so service during commuting hours is not a necessity, although commuters may elect to use the Circulator to complete commute trips originating on Metro.

The mall museums are generally open from 10 a.m. to 5:30 p.m. every day except Christmas. The monuments are officially open from 8 a.m. to 11:45 p.m. every day. However, 90% of monument visitors visit between 10 a.m. and 9 p.m, and nearly 97% of monument visitors visit between 8 a.m. and 9 p.m. Only 3% visit after 9 p.m. The Washington Monument, Capitol, and White House generally require visitors to arrive before 8 a.m. in order to obtain the limited number of tickets available each day. These people would generally be arriving at those locations from their hotels by Metrorail or by tour bus, but at 8 a.m. many people leave those locations to visit other sites and return later in the day at their scheduled visitation time.

While some downtown workers may arrive before 8 a.m., most workers and shoppers would not be making local trips until at least 8 or 9 a.m. Most business-related local trips would generally end by about 6 p.m. and dinner-related trips would end by 8 or 9 p.m. While people visiting downtown in the evening for entertainment purposes could stay past 9 p.m., they would generally be able to access Metrorail directly for the late trip home.

In order to serve these markets adequately, it is recommended that service on all four circulator routes be provided from 8 a.m. until 9 p.m., seven days a week. The 8 a.m. beginning of service will accommodate all but the earliest visitors to the monuments, will serve people who receive scheduled time tickets when they are distributed at 8 a.m., and is early enough to serve any local trips in the downtown made by downtown workers. The 9 p.m. end of service will accommodate evening trips between downtown offices, restaurants, and entertainment venues, and will serve early evening trips to the monuments. It is recommended that later service, until 11 p.m. be provided on the Monuments Route only in peak tourist seasons to accommodate larger crowds and provide an after-dark viewing experience in the spring and summer.

Running Times and Cycle Times
The travel time required by a bus to make a complete round trip (called the *round trip running time*) was estimated for each route. Several sources of information were used. On streets where

Metrobus service operates, Metrobus schedules were used to estimate the running time for the circulator at various times of day. Along the mall, where there is little to no Metrobus service, travel times were measured by automobile[28]. Estimated running times from the previous circulator study were also considered[29]. Finally, on some streets, bus travel speeds were estimated based on the speeds used for similar streets. Speeds on K Street were assumed to be somewhat higher than on other streets, due to the planned busway facility. The round trip running time for each route, by time of day and day of week, is shown in Table 4-1. Note that the White House-Capitol Route is shown as two routes (a clockwise route and a counter-clockwise route) since, operationally, it would function as two separate routes, with one set of buses always traveling clockwise, and another set traveling counter-clockwise. Both alternatives for the White House-Capitol Route are shown.

Running times typically represent average travel times on a bus route. If schedules only allowed the average time then any disruption, or even random variation, in travel time could cause delays and trigger the bunching of buses. Therefore, additional time is usually added to the schedule to allow drivers to catch up when delayed. This helps keep the service reliable and on schedule. The total time allowed in the schedule for a round trip is called the *cycle time*. Typically, cycle times are 10% to 25% longer than round trip running times. Minimum cycle times, also shown in Table 4-1, were calculated for each circulator route, by time of day and day of week, by adding 15% to the round trip running time. (Actual cycle times may need to be a bit longer, in order to schedule buses at the desired frequency.)

The additional time added to the round trip running time to get the cycle time is often referred to as *layover*. Scheduled layover time insures that the next trip starts on time. On a typical bus route, the layover time is spent at the end of the line with the bus empty so that no delay is experienced by passengers. This will work best on the Monuments Route and the K Street Route where layover can occur at the Smithsonian Metrorail mall entrance, Union Station, and Georgetown University. On the North-South Route, layover should probably occur at the Convention Center under the assumption that few riders will ride through at that point, with most choosing to walk between 7th and 9th. On the White House-Capitol Route, however, there is no place where the bus will be empty. Layover time will have to be distributed in smaller increments around the route. It may be possible in this case to reduce the cycle time as more experience is gained with the operation, but care must be taken to balance the reduction of passenger delays with increased variability in the frequency of service and the potential for bus bunching.

Frequency of Service

The frequency of service, expressed as the *headway*, or time interval between buses, is typically determined by a combination of demand and a policy decision as to the longest acceptable passenger wait time. The longest acceptable passenger wait time, (also called the *policy headway*), may vary by time of day and day of week. The DCPG has adopted the policies shown in Table 4-2. These policies reflect the desire of the DCPG to provide a high quality service that

[28] A limited amount of automobile travel time data was collected in August 2002. Because traffic was relatively light at the time due to the Congressional recess, the measured travel times were increased by 40-50% to account for heavier traffic and the need for buses to make frequent stops.

[29] Parsons Transportation Group, prepared for the Downtown Business Improvement District, *Technical Report for a Downtown Circulator in Washington, DC*, April 1999

Table 4-1: Circulator Running Times and Cycle Times

	Running Time			Minimum Cycle Time		
	Saturday	Sunday	Weekday	Saturday	Sunday	Weekday
White House/Capitol Route – Clockwise – Alternative A						
8-10a	56	49	54	64	56	62
10a-1p	58	55	59	67	63	68
1p-5p	58	55	64	67	63	74
5p-7p	58	55	65	67	63	75
7p-9p	47	47	49	54	54	56
White House/Capitol Route-Counter Clockwise – Alternative A						
8-10a	47	45	54	54	52	62
10a-1p	57	52	61	66	60	70
1p-5p	57	52	63	66	60	72
5p-7p	57	52	64	66	60	74
7p-9p	46	43	50	53	49	58
White House/Capitol Route – Clockwise – Alternative B						
8-10a	56	49	53	64	56	61
10a-1p	57	55	59	66	63	68
1p-5p	57	55	63	66	63	72
5p-7p	57	55	63	66	63	72
7p-9p	45	44	46	52	51	53
White House/Capitol Route-Counter Clockwise – Alternative B						
8-10a	45	43	50	52	49	58
10a-1p	53	50	58	61	58	67
1p-5p	53	50	59	61	58	68
5p-7p	53	50	59	61	58	68
7p-9p	42	40	46	48	46	53
Monuments Route						
8-10a	22	22	25	25	25	29
10a-8p	26	26	26	30	30	30
8p-11p	21	21	22	24	24	25
Monuments Route – Presidential Routing (with Alternative B only)						
8-10a	32	32	37	37	37	43
10a-8p	36	36	36	41	41	41
8p-11p	31	31	31	36	36	36
North-South Route						
8-10a	27	27	30	31	31	35
10a-4p	33	33	33	38	38	38
4-7p	33	33	36	38	38	41
7p-9p	30	30	30	35	35	35
K Street Route						
8-10a	52	50	63	60	58	72
10a-4p	58	57	64	67	66	74
4-7p	58	57	68	67	66	78
7p-9p	54	52	59	62	60	68

Table 4-2: Circulator Maximum Passenger Wait Time

Tourist-only routes (Monuments Route)	every day 10 a.m. to 8 p.m.	5 minutes
	all other times	10 minutes
White House-Capitol	weekdays 8 a.m. to 7 p.m.	5 minutes
	weekends 10 a.m. to 7 p.m.	5 minutes
	All other times	10 minutes
All other routes	weekdays 8 a.m. to 7 p.m.	5 minutes
	All other times	10 minutes

is attractive to the target markets. Passengers will generally perceive up to a five minute wait to be inconsequential for a short distance trip such as those on the Circulator. Longer wait times could discourage ridership. The policies also reflect the common transit planning practice of focusing resources on providing a higher level of service during times when the most users will benefit, while still providing a lower but adequate level of service at other times.

When the demand for service would exceed the capacity of the vehicle, frequency can be increased to provide enough capacity. Ridership estimates (documented later in this plan) were used to determine the need for additional capacity during various hours of the day and days of the week. To accomplish this, the service day was divided into five periods, morning peak, mid-day, afternoon, evening peak, and evening. Similarly the year was broken into three seasons, winter (December through February), peak season (April through August), and the intermediate season (March, September, October, and November). Average daily ridership was then estimated for each season using seasonal factors from National Park Service and Smithsonian data. Park Service and Smithsonian data was also used to estimate ridership during the peak hour of each of the five daily time periods for weekdays, Saturdays, and Sundays. Weekday ridership during peak tourist season was further distinguished between the higher ridership weekdays (Wednesday through Friday) and the lower ridership weekdays. The resulting ridership estimates were then used to determine the average number of passengers that would be on board at the points where the maximum passenger loads occur.

The analysis concluded that, during both the winter and intermediate seasons, the policy headways could be operated on all routes with no overcrowding. These headways are shown in Table 4-3. Overcrowding was considered to occur when the number of passengers (both seated and standing) on board the vehicle at the most crowded location is expected to average more than what is considered to be the *design capacity* of a bus. For purposes of this analysis, the design capacity was considered to be 55 passengers, which represents approximately 40 seated passengers and 15 standeees.

Table 4-3: Circulator Headways and Vehicle Requirements – Off-Peak Season

	Off-Peak Season (7 months)								
	Headway			Cycle Time			Buses		
	Sat.	Sun.	M-F	Sat.	Sun.	M-F	Sat.	Sun.	M-F
White House/Capitol Route - Clockwise									
8-10a	10	10	5	70	60	65	7	6	13
10a-1p	5	5	5	70	65	70	14	13	14
1p-5p	5	5	5	70	65	75	**14**	**13**	**15**
5p-7p	5	5	5	70	65	75	14	13	15
7p-9p	10	10	10	60	60	60	6	6	6
White House/Capitol Route-Counter Clockwise									
8-10a	10	10	5	60	60	65	6	6	13
10a-1p	5	5	5	70	60	75	14	12	15
1p-5p	5	5	5	70	60	75	**14**	**12**	**15**
5p-7p	5	5	5	70	60	75	14	12	15
7p-9p	10	10	10	60	50	60	6	5	6
Monuments Route									
8-10a	10	10	10	30	30	30	3	3	3
10a-2p	5	5	5	30	30	30	6	6	6
2p-8p	5	5	5	30	30	30	**6**	**6**	**6**
8p-9p	10	10	10	30	30	30	3	3	3
North-South Route									
8-10a	10	10	5	40	40	35	4	4	7
10a-4p	10	10	5	40	40	40	4	4	8
4-7p	10	10	5	40	40	45	**4**	**4**	**9**
7p-9p	10	10	10	40	40	40	4	4	4
K Street Route									
8-10a	10	10	5	60	60	75	6	6	15
10a-4p	10	10	5	70	70	75	7	7	15
4-7p	10	10	5	70	70	80	**7**	**7**	**16**
7p-9p	10	10	10	70	60	70	7	6	7
Total							**45**	**42**	**61**

Table 4-4: Circulator Headways and Vehicle Requirements – Peak Season

	Peak Season (5 months)											
	Headway				Cycle Time				Buses			
	Sat.	Sun.	M/T	W/Th/F	Sat.	Sun.	M/T	W/Th/F	Sat.	Sun.	M/T	W/Th/F
White House/Capitol Route - Clockwise												
8-10a	10	10	5	5	70	60	65	65	7	6	13	13
10a-1p	3.5	4.5	4.5	4	70	68	72	68	20	15	16	17
1p-5p	3.5	4.5	4.5	4	70	68	77	76	**20**	**15**	**17**	**19**
5p-7p	5	5	5	5	70	65	75	75	14	13	15	15
7p-9p	10	10	10	10	60	60	60	60	6	6	6	6
White House/Capitol Route-Counter Clockwise												
8-10a	10	10	5	5	60	60	65	65	6	6	13	13
10a-1p	4	5	5	4	68	60	75	72	17	12	15	18
1p-5p	3	3.5	4	3.5	66	63	76	74	**22**	**18**	**19**	**21**
5p-7p	3	4	4	4	66	60	76	76	22	15	19	19
7p-9p	10	10	10	10	60	50	60	60	6	5	6	6
Monuments Route												
8-10a	8	10	10	10	32	30	30	30	4	3	3	3
10a-2p	4	5	5	5	32	30	30	30	8	6	6	6
2p-8p	3	4.5	4.5	3.5	30	32	32	32	**10**	**7**	**7**	**9**
8p-9p	4	5	5	5	28	25	30	30	7	5	6	6
9p-11p	5	5	5	5	25	25	30	30	5	5	6	6
North-South Route												
8-10a	10	10	5	5	40	40	35	35	4	4	7	7
10a-4p	10	10	5	5	40	40	40	40	4	4	8	8
4-7p	10	10	5	5	40	40	45	45	**4**	**4**	**9**	**9**
7p-9p	10	10	10	10	40	40	40	40	4	4	4	4
K Street Route												
8-10a	10	10	5	5	60	60	75	75	6	6	15	15
10a-4p	10	10	5	5	70	70	75	75	7	7	15	15
4-7p	10	10	5	5	70	70	80	80	**7**	**7**	**16**	**16**
7p-9p	10	10	10	10	70	60	70	70	7	6	7	7
Total									**63**	**51**	**68**	**74**

During the peak season, both the Monuments Route and the White House-Capitol Route would require additional service beyond the minimum service levels. This would occur between 10 a.m. and 7 p.m. on the White House-Capitol Route nearly every day, and throughout the service day on the Monuments Route. The recommended headways are shown in Table 4-4.

Peak Vehicle Requirements
Tables 4-3 and 4-4 show, in addition to the headways, the recommended cycle times and vehicle requirements for Alternative A. (The cycle times here differ slightly from the minimums in Table 4-1 since the actual cycle time operated must be an even multiple of the headway operated.) The vehicle requirements are determined simply by dividing the cycle time by the headway. Cycle times and vehicle requirements for Alternative B are shown in Appendix D.

The tables show that, under Alternative A, the White House-Capitol Route will require 30 vehicles during the off-peak season on weekdays during the peak hours between 1 p.m. and 7 p.m. This increases to 40 vehicles in the peak season. The Monuments Route will require six buses at most times outside peak season, but will require up to nine buses on weekdays and ten on Saturdays in peak season. The North-South Route will require nine buses on weekdays and four on weekends during all seasons. The K Street Route will require 16 buses on weekdays and seven on weekends during all seasons.

4.2 Resources and Impacts

This section presents the transportation impacts of the proposed circulator system, including the resources required to operate the system. Non-transportation impacts are documented separately in an Environmental Study.

4.2.1 Resource Requirements

The operation of the Circulator will require substantial resources. Day to day operation of the circulator is expected to be the responsibility of a contractor. The contractor would be paid by the sponsoring agency to operate the service. The details of the operation of the service (such as staffing levels, etc.) would be the contractor's responsibility. The contractor would provide all of the necessary operations, maintenance, and administrative staff and would also be responsible for providing a vehicle storage, fueling, and maintenance facility. It is anticipated that the vehicles themselves would be provided by the sponsoring agency, with the contractor responsible for maintenance. The District of Columbia would provide shelters and signs. The resources required, therefore, include the operating costs paid to the contractor and vehicles needed.

Operating Costs
Operating costs to private contractors are typically based on a unit cost for service, most commonly the cost per *revenue-vehicle-hour* of service. A revenue-vehicle-hour is time spent by a vehicle actually providing service. This typically includes the time the vehicle is moving and available to passengers, the time spent at stops, and the time spent in normal layover at the end of the route between trips. It does not include deadhead time spent traveling to or from the storage facility, nor time spent when the vehicle is parked for extended periods without an operator. In some cases, operating costs may also include a component that is based on the number of *revenue-vehicle-miles* of service. Revenue-vehicle-miles are calculated in a manner similar to revenue-vehicle-hours. WMATA uses a revenue-vehicle-hour basis in determining the cost of local service reimbursed by local jurisdictions. However, the Metropolitan Washington Regional

Bus Study developed cost factors for bus service in the region based on a combination of revenue-vehicle-hours and revenue-vehicle-miles.

The number of annual revenue-vehicle-miles was determined by multiplying the length of each route by the number of trips that would be provided in a year based on the headways and length of each time period shown in Tables 4-3 and 4-4, and the number of days of each type in a year for both peak and off-peak seasons. The number of annual revenue-vehicle-hours was determined by multiplying the number of buses on each route in each time period by the length of each time period as shown in Tables 4-3 and 4-4, and the number of days of each type in a year for both peak and off-peak seasons. The WMATA operating cost factors for non-regional service used in the Metropolitan Washington Regional Bus Study[30] were used to determine the annual cost of circulator operation. The resulting estimated annual revenue-hours and –miles and annual operating costs for the two alternatives are shown in Tables 4-5 and 4-6. The tables show that approximately half of the $17 million annual operating cost would be for the White House-Capitol Route. One fourth would be for the K Street Route and the remaining one fourth would be for the North-South and the Monuments Routes.

Table 4-5: Annual Resource Requirements and Operating Costs – Alternative A

	Annual Revenue-Miles	Annual Revenue-Hours	Annual Operating Cost (millions)
White House/Capitol Route	757,225	128,567	$8.643
Monuments Route	248,897	29,877	$2.212
North-South Route	191,318	30,628	$2.089
K Street Route	417,256	56,472	$4.032
TOTAL	**1,614,697**	**245,544**	**$16.976**

Table 4-6: Annual Resource Requirements and Operating Costs – Alternative B

	Annual Revenue-Miles	Annual Revenue-Hours	Annual Operating Cost (millions)
White House/Capitol Route	720,773	124,364	$8.327
Monuments Route	242,563	29,003	$2.150
Presidential route	48,316	10,108	$0.648
North-South Route	191,318	30,628	$2.089
K Street Route	417,256	56,472	$4.032
TOTAL	**1,620,227**	**250,575**	**$17.247**

[30] WMATA non-regional cost factors are $50.79 per revenue-vehicle-hour plus $2.79 per revenue-vehicle-mile.

Vehicle Fleet Requirements

The total vehicle fleet required to operate a transit service is calculated based on the maximum number of vehicles scheduled in service at any time, plus an increment to account for vehicles out of service for maintenance. Federal Transit Administration guidelines indicate that this increment should be 15% of the maximum vehicles in service. As noted in the previous section, operation of all four circulator routes under Alternative A would require 61 vehicles in the off-peak season and as many as 74 vehicles in the peak season. Alternative B would also require 74 vehicles in peak season so there would be no difference between the alternatives in terms of vehicle requirements. With 74 vehicles in maximum service, the circulator would require a fleet of 86 vehicles. The Capital Plan for the circulator, included as a later section of this Implementation Plan, is based on the purchase of a fleet of 86 vehicles.

4.2.2 Service Coverage

The circulator is designed to be accessible to the vast majority of downtown workers and visitors. Typically, transit service is considered accessible if a target location or population lies within ¼ mile of the transit route. Given the location of the circulator in a dense downtown area, the orientation of the circulator toward very short trips, and the need for a high level of convenience to attract the target markets, it is also of interest to consider whether target locations lie within an even shorter distance of the routes. The locations of riders in three target markets for which data was available were compared to the area within ¼ mile and within 1/8 mile of the proposed circulator routes. This comparison is shown in Figures 4-11, 4-12, and 4-13. In each figure, the area within 1/8 mile of the circulator area is shown. Figure 4-11 also shows the major visitor attractions and annual visitor volumes that were shown in Figure 3-1. Virtually all of the attractions are 1/8 mile or less from a circulator route. Figure 4-12 shows downtown employment based on COG estimates of employment by traffic zone that was shown in Figures 3-2 and 3-3. The vast majority of downtown employment is covered within 1/8 mile. (Note that these locations are approximated within each zone. These are not based on actual addresses.) Figure 4-13 shows the actual locations and numbers of federal employees in the core area that was shown in Figure 3-4. Only a few federal employment sites are not within 1/8 mile, mostly in the Federal Triangle, Federal Center Southwest, and near Union Station. Virtually all of these are within ¼ mile. (Note that this figure uses the actual locations of federal work sites.)

Table 4-7 shows the number and percentage of total and federal employees in the core area that are within ¼ and 1/8 mile of the circulator. For purposes of this analysis, the core area was defined by M Street (north), 3rd Street (east), M Street (south), and the Potomac River. For either alternative, over 75% of core area federal employees are within 1/8 mile of a circulator route and over 90% are within ¼ mile.

4.2.3 Ridership Impacts

The potential markets for the circulator were summarized in Section 3. The detailed estimates of the potential market shown in Tables 3-4, 3-8 and 3-10 formed the basis for ridership estimates for the circulator. The ridership estimates presented in this section are documented in Appendix E.

For the visitor market, little to no data exists on current share of trips using public transit. Therefore, shares of the market that might be captured by the circulator were estimated for each individual entry in Tables 3-4 and 3-8. For visitor circulation trips between attractions, the estimated shares of the market that would be captured ranged between 10% and 50%. Lower

Table 4-7: Employment Coverage of Circulator Routes

	Employment within 1/8 Mile			Employment within 1/4 Mile		
	All Employees	Federal	% of Core Federal	All Employees	Federal	% of Core Federal
Alternative A	288,421	165,614	78%	411,218	194,694	91%
Alternative B	278,375	161,848	76%	412,100	197,259	93%

values were used where circulator connections would not be as good and where other transit options exist. The highest values were used for trips to the monuments where circulator service would be good and parking is limited.

For visitor access trips from around the region, estimates ranged from 2% to 10% for most areas, while from downtown hotels and the convention center, estimates ranged from 5% to 30%. The exception to this was the Monuments area where estimated shares ranged from 15% to 45%.

For local trips in the core area made by employees and shoppers, shares were estimated based on current transit shares for each origin-destination as indicated by the data obtained from the COG regional model. A figure lower than the current share was used where good transit alternatives exist and the circulator could capture some of the market. A figure higher than the current share was only used in a few cases where the circulator is expected to be a major improvement in providing transit connections.

Riders were assigned to routes assuming the most logical path between each origin and destination. The estimated number of riders on each route, by market, is shown in Table 4-8. These ridership figures are average weekday riders[31]. Peak season ridership is expected to be considerably higher. Off-peak season ridership would be lower. Annual ridership was derived from the annual figure for visitors plus as expansion of average weekday non-visitor riders using an appropriate annualization factor for non-visitor travel[32]. The annual ridership by market is shown in Table 4-9. The tables show that the majority of riders on the circulator system would be visitor circulation or access/egress trips. This is also true on three of the four routes.

The White House-Capitol Route ridership would be 76% visitor trips. The major visitor markets served by this route would use the segment connecting Union Station, the Capitol Visitors' Center, and the Mall. The major non-visitor markets served would be for travel between the downtown and both the Capitol area and the area west of the White House.

The Monuments Route would serve only visitors. The very high ridership levels on this route reflect the fact that many riders would board and alight this route several times in one visit, stopping at several stops to visit the many attractions.

[31] The average daily trips in visitor markets in Tables 1-4 and 1-8 were converted to average weekday using data on Smithsonian attendance by day of week. In the employee/shopper market, figures in Table 1-10 are already average weekday.

[32] Average weekday non-visitor ridership was converted to annual ridership assuming 292 weekday equivalents annually. This is consistent with Regional Bus Study methodology.

Table 4-8: Estimated Average Weekday Ridership by Route and Market

	Visitor Circulation	Visitor Access/ Egress	Employee/ Shopper Circulation	Total
White House/Capitol Route	3,434	6,454	4,291	14,179
Monuments Route	8,475	8,684	0	17,159
North-South Route	2,245	401	1,832	4,478
K Street Route	2,146	699	6,325	9,170
TOTAL	**16,300**	**16,239**	**12,448**	**44,987**

Table 4-9: Estimated Annual Ridership by Route and Market

	Visitor Circulation	Visitor Access/ Egress	Employee/ Shopper Circulation	Total
White House/Capitol Route	1,373,481	2,581,672	1,253,025	5,208,178
Monuments Route	3,240,467	3,320,489	0	6,560,956
North-South Route	898,173	160,557	534,849	1,593,579
K Street Route	858,276	279,679	1,846,991	2,984,946
TOTAL	**6,370,396**	**6,342,398**	**3,634,864**	**16,347,658**

The North-South Route ridership would be 66% visitor trips. The major visitor markets served by this route would use the segment connecting the Convention Center, the downtown, and the Mall. The major non-visitor markets served would be for travel between the area north of the Mall and area south of the Mall.

Only the K Street Route would serve a majority of non-visitor trips, with only 38% visitor trips. The major visitor markets served by this route would be local trips within Georgetown and trips from Metrorail to Georgetown that would transfer at Farragut or Mt. Vernon Squares. The major non-visitor markets served would be for travel along the K Street corridor and between the K Street corridor and Georgetown.

In order to determine the required frequency of service previously shown in Tables 4-3 and 4-4, ridership estimates were used to calculate passenger loads at the maximum load point on each route. This was done by first determining the origin-destination pairs that would contribute to the passenger volumes at the peak load point on each route. The average daily visitor ridership was factored up or down to reflect day-of-week and seasonal variation based on data from the Smithsonian. Non-visitor ridership was not varied seasonally, but was adjusted to reflect lower ridership levels on weekends.

4.2.4 Other Transportation Impacts

Traffic Impacts

Roadways throughout the study area carry heavy volumes of vehicle traffic and often operate during failing or near failing levels of service at peak hours. The analysis of impacts of the

Circulator service on existing levels of service were calculated from Average Annual Daily Traffic (AADT) volumes obtained from the District of Columbia DOT using a traffic planning program developed by the Florida DOT. Traffic level of service (LOS) was calculated for each intersection and segment of roadway in the study area. This analysis was used to compare the impacts of the Circulator to existing conditions

The White House-Capitol route would add 12 to 17 buses per hour in each direction during weekday peak-hours, for a total of 24 to 34 buses. The North-South and K Street routes would add 12 buses per hour in each direction during weekday peak-hours, for a total of 24 buses. The Monuments route, which is one-way, would add a total of 12 to 17 buses per hour in one direction to roadways. On weekends, the White House-Capitol Route and the Monuments route would add up to 20 buses per hour in each direction.

No significant traffic impacts are anticipated along any of the roadways traversed by the circulator. Analysis utilizing traffic analysis software shows that high existing volumes of traffic, high levels of congestion, and small increments of traffic being added by the preferred alternative would result in no adverse traffic impacts.

Parking Impacts
A variety of private and public parking facilities exist in the project area, including parking garages, surface lots, and on-street parking. On-street parking within the project area is often subject to restrictions, such as no peak-hour parking, time or zone restrictions or is metered. The removal of existing on-street parking may be required at new bus stops. Of the 51 new bus stops proposed, 36 would require the elimination of parking. As a result, the elimination of a total of 144 on-street spaces would be required for the 36 new bus stops.

Impacts on Other Transit Services
The circulator is intended to supplement existing regional transit services, not duplicate or replace them. It is anticipated that some trips now made within the downtown on Metrobus and Metrorail could be diverted to the circulator, due to the circulator's lower cost, better frequency and more convenient access. On the other hand, the circulator could also encourage additional trips on the regional transit network, making transit a more attractive option by providing greater mobility within the downtown once riders arrive downtown using the regional system. These impacts have not been quantified, but are not expected to have a major net impact on regional transit ridership.

The circulator could provide a more cost-effective alternative for federal agencies who operate their own shuttle services in the core area. It is possible that many of these services could be curtailed or eliminated once the Downtown Circulator becomes operational. The National Capital Planning Commission is currently studying the possible ramifications for federal agency shuttles.

4.3 Implementation Phasing

The proposed Downtown Circulator system is an extensive 74 bus system that would serve a variety of markets in the core area. Because there are multiple routes, it would be possible to start with a smaller number of routes and do a phased implementation. Phasing would allow the system to begin to build ridership and recognition in the market at a lower cost, address operational issues with a smaller network, and establish and refine the fare structure and fare

media distribution network. A smaller initial system might also allow the service the be operated from an existing garage facility, shortening the necessary startup time.

At the same time, care must be taken to implement an initial system that is viable, both financially and in establishing a large enough ridership base. It is also important to select an initial system that can be implemented without delays due to difficult unresolved issues or controversies. The Circulator will serve trips by downtown workers and shoppers, conventioneers, business travelers, and tourists. The White House-Capitol and Monuments Routes will depend largely on the visitor market for success. These routes will also depend on successful agreements with the Park Service on operating rights on the National Mall, and on successful agreements regarding operations on the streets around the White House that are restricted from full traffic. The North-South and K Street Routes do not face these hurdles and are also expected to attract more of a mix of downtown workers and visitors (especially conventioneers). The K Street route is ultimately dependent on the K Street busway to operate efficiently and reliably, however, it could begin operations before the busway is complete. The ability to attract funding in a timely manner for the various routes could also affect the routes chosen for initial implementation.

Considering these factors, the DCPG has elected to implement the North-South and K Street Routes first. This would be an approximately 25 peak bus system. It could be implemented relatively quickly, without substantial negotiations regarding Mall operations or White House security. These routes would address a substantial amount of the ridership demand by downtown workers and shoppers as well as the conventioneers market. While tourists may find these routes useful accessing the downtown and Georgetown, much of the marketing to tourists would be delayed until the second phase, when a more coordinated visitor transportation strategy involving the National Park Service could be implemented.

The initial phase would require at least 25 peak buses and, as shown in Table 4-10, would cost $6.1 million in annual operating costs. (It should be noted that slower initial operations on K Street, before the busway is completed, would slightly increase initial operating costs and vehicle requirements over these estimates.)

Together, the two initial routes would serve much of the downtown employment base. A majority of federal workers (55%) would work within ¼ mile of the two routes. The federal workers not served would be those around the State Department and those in the western part of the Federal Triangle.

Ridership was not estimated separately for this initial system. Of the 4.6 million annual riders projected for these routes under full implementation, the 2.4 million who are downtown workers and shoppers could be expected to use the two routes as an initial phase. Of the 2.2 million visitors, many, especially conventioneers, may still be attracted to these routes even though the Circulator would not yet be a complete visitor transportation network for the area.

As with full implementation, traffic impacts are expected to be negligible, with only 12 buses per hour in each direction on each route. The two routes would require 21 new stops, of which 18 would require the elimination of parking, resulting in a loss of approximately 72 parking spaces in the downtown.

Table 4-10: Annual Resource Requirements and Operating Costs – Initial Phase

	Annual Revenue-Miles	Annual Revenue-Hours	Annual Operating Cost (millions)
North-South Route	191,318	30,628	$2.089
K Street Route	417,256	56,472	$4.032
TOTAL	**608,574**	**87,100**	**$6.121**

4.4 Evaluation Methods and Procedures

The DCPG, or sponsoring agency for the circulator, should establish a monitoring and evaluation program to assess both the performance of the contract operator and to evaluate the effectiveness of the circulator in meeting its goals. The evaluation will include startup activities, ongoing and periodic data collection activities, and evaluation activities.

4.4.1 System Startup

It typically takes a period of at least several months for any new transit service to develop its ridership base and achieve some level of ridership stability. Local area residents will, after a few weeks or months, become familiar with the services and their benefits. Visitor familiarity will depend on the familiarity of those providing them with information - hotels, visitor attractions, tour companies, etc. Early monitoring of the initial stage of the system, or any additional route startups, should focus on ensuring that information is being provided to the public and that the service is being operated as planned.

Initial monitoring activities should focus on ensuring that the system is operating as intended. Monitoring activities should be concentrated on checking that scheduled travel times and cycle times are sufficient and are not excessive, as deviations either way could create undesirable variability in headways and damage service reliability. Service reliability should be spot-checked at several points on the routes, with deviations from the scheduled headway noted. Running time and reliability problems should be investigated further and either schedule or operational adjustments should be made to address them. Spot-checks should also be done to insure that early ridership does not exceed capacity, though this is unlikely.

Collection of daily ridership data should begin at system startup, however, such early data would not be an accurate indicator of the service's effectiveness.

4.4.2 Data Collection

The data needs for system monitoring and evaluation can be divided into ongoing data collection activities and periodic and special data collection activities.

Ongoing Data Collection

Ongoing data collection should consist of assembling data through non-labor intensive methods. The contractor should be required to provide daily information on the service provided, ridership, and revenue collected on-board the vehicles.

The levels of service provided, expressed as the number of revenue-vehicle-hours provided on each route, should be specified by the service schedules. Deviations from the scheduled service

levels, either trips missed or additional service provided to meet unusual demand, as well as any significant disruptions in service, should be reported by the contractor. This should be reported by route and day and provided on at least a monthly basis.

Ridership and revenue collected on-board the vehicles should also be reported by route and day. The fareboxes purchased and the fare media and procedures adopted will determine the methods and ease of collection of this data. Fareboxes purchased for the circulator will have smart card capability and be compatible with fareboxes being installed on all Metrobuses. Systems that require the least driver intervention to record boardings will produce the most reliable information. Systems that require drivers to record some categories of fare media will require spot-checks or estimation procedures to accurately report ridership. The contractor should be able to provide accurate reports of on-board revenue provided that adequate revenue control procedures are in place.

Some revenue will not be collected on-board, such as that obtained through the sale of passes and transfers. This revenue will need to be reported at least monthly.

Periodic and Special Data Collection

After an initial startup period of at least three, but preferably six, months, on-board ridership counts ("ride checks") should be conducted to identify actual maximum load points on each route at various times of day. This should also be repeated during the height of the tourist season (or during the off season, depending when the initial counts are conducted.) These counts will establish the locations where periodic monitoring of passengers volumes should occur in order to insure that service levels are matched to passenger demand. Once these maximum load points have been identified, periodic one-day counts ("point checks") should be conducted at those locations to gauge the need to adjust service levels to meet demand. These counts can also be used to assess the variability of the actual headways as a measure of service reliability. The frequency of these one-day counts can be reduced over time as ridership stabilizes and service levels are refined. Initially, they should be done at least monthly and should be done on different days of the week. The results should be compared to the daily ridership counts to determine how maximum loads relate to the less labor-intensive daily counts on different days of the week and in different seasons.

If the success of the circulator in attracting riders in the various target markets is to be determined, on-board rider surveys will have to be conducted. These should be done during a peak tourist month (preferably April) and during a typical off-season month (such as October). They should be done at the first opportunity, but at least three months after implementation. Questions should focus on rider characteristics, travel patterns, and opportunities to improve the service.

4.4.3 Evaluation

The data collection activities should provide information to refine and improve the service as well as monitor the quality and evaluate the effectiveness of the service.

The nature of the markets served by the circulator will make ridership fluctuate more throughout the week and over the course of the year than is typically true of transit service. As a result, monitoring and refinement of ridership and service levels will be necessary to fine tune the service to both meet demand and avoid unnecessary costs. Maximum loads from the first ride checks and point checks should be related to daily ridership counts so that the daily counts can be used to judge whether the scheduled service levels are adequate at various points in the season

and throughout the week. Then the daily ridership counts can be used to identify when ridership changes enough to warrant further investigation or changes in service. Early spot checks and ongoing point checks should also be used to monitor the reliability of service and identify whether schedule changes or modified operational procedures are required.

Regular reports of ridership, revenue, and service provided should be used to conduct ongoing evaluations of each route and of the service as a whole. Ridership information should be available at the route level on a daily basis. Measures such as average daily ridership, passengers per vehicle-hour and cost per passenger should be calculated on a monthly basis, separating weekdays and weekends. Depending on the chosen fare media and fare collection procedures, it should be possible, with some degree of accuracy, to estimate revenue by route from the daily ridership counts. This will allow the calculation of the average fare and of the cost recovery ratio (revenue divided by cost) for each route.

This information will allow the DCPG, or the sponsoring agency, to evaluate the performance and effectiveness of the service, identify areas where additional information is needed, and develop strategies to address identified problems, deficiencies, and service needs.